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(71) Applicant
Georg Fischer Aktiengesellschaft

(Incorporated in Switzerland)

CH-8201 Schaffhausen, Switzerland

(72) Inventor
Ivo Henych

(74) Agent and/or Address for Service
Urquhart-Dykes & Lord,
5th Floor, Tower House, Merrion Way, Leeds, West Yorkshire LS2 8PA

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(54) Process for the production of pearlitic cast iron

(57) The process comprises producing a molten mass of cast iron in a vessel, transferring the molten mass to a casting mold, and introducing a pearlite stabilizing agent into the molten mass while it is being transferred from the vessel to the casting mold. Preferably, the pearlite stabilizing agent is introduced into the pouring stream of the molten cast iron. Tin (Sn) and antimony (Sb) are proposed as pearlite stabilizing agents, which may take various physical forms and might be accompanied by an inoculant.

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SPECIFICATION

Process for the production of pearlitic cast iron

The instant invention relates to a process for the production of cast iron which is high in pearlite values, for example, grey cast iron, nodular cast iron ("GGG"), and vermicular cast iron ("GGV").

Heretofore, it has been known to produce pearlitic GG, GGG and GGV cast iron by adding a pearlite stabilizing agent, for example, copper, into the molten cast iron mass while the molten mass is in a smelting furnace or in a ladle. This treatment is done especially when the molten mass of cast iron is poured directly into a casting mold from an automatic smelting furnace or from a stopper ladle. However, there are several drawbacks to this procedure when the same pouring (holding) furnace is used for the production of cast iron high in pearlite values as well as for the production of cast iron high in ferritic values. Each time it is desired to change over from the production of pearlite cast iron to ferritic cast iron, it is necessary to completely empty the cast iron furnace. This is because if any pearlite stabilizing agents remain in the furnace, they would have a negative effect on the production of cast iron which is high in ferritic values. However, it is a time consuming process to completely empty a pneumatically operated casting furnace. In addition, it may be necessary to stop the entire casting line while the emptying takes place.

It is therefore desirable to provide a process for producing pearlite cast iron which does not require the smelting furnace or ladle to be completely emptied when changing over from the production of pearlite cast iron.

The aforementioned problem is solved by means of the process of the present invention which, in its broadest sense, comprises producing a molten mass of cast iron in a vessel, transferring the molten mass into a casting mold, and introducing a pearlite stabilizing agent into the molten mass as it is being transferred from the vessel into the casting mold. preferably, the pearlite stabilizing agent is added into a pouring stream of the molten cast iron. Most preferably, the pearlite stabilizing agent comprises tin (Sn) or antimony (Sb).

Further advantageous embodiments of the present invention are described hereinbelow.

Detailed Description of Preferred Embodiments

In its broadest scope the process according to the instant invention comprises adding at least one pearlite stabilizing agent into the mass of molten cast iron while the mass is being transferred from a casting furnace or a casting ladle into the interior of a casting mold. Preferably, the pearlite stabilizing agent is added into the pouring stream of the molten cast iron. In this way the melting and casting structures are not exposed to contamination by the pearlite stabilizing agents.

Because the pearlite stabilizing agent is added to the molten mass after it has been removed from its source of heat, it is important that the pearlite stabilizing agent not place too great a thermic burden upon the pouring stream. Accordingly, it is desirable that the pearlite stabilizing agent comprise tin (Sn) or antimony (Sb) which are required in considerably smaller quantities than copper (Cu). This ensures that the added quantity of pearlite stabilizing agent, and an inoculant which may also be added, are melted down immediately and evenly upon introduction into the pouring stream. This quick melting down is also facilitated by the low melting temperatures and the low specific heat values of Sn and Sb as compared with Cu.

The following examples will further illustrate the inventive process.

Example 1

For the production of the nodular cast iron known as GGG 50, normally 0.3% Cu is added to a cast iron melt as an alloy to achieve the necessary pearlite contents. When scrap iron, generally thought to contain less than 0.1% Cu, is melted, an addition of only approximately 0.015% Sn is required to achieve the necessary pearlite values. Thus, 0.015% Sn is the functional equivalent of 0.2% Cu.

Example 2

For the production of the nodular cast iron known as GGG 60, normally 0.5 to 0.7% Cu is added to a cast iron melt to achieve the necessary pearlite contents. Under the same conditions as in example 1, an addition of approximately .015% Sb is needed to achieve the necessary pearlite value, thus replacing 0.4 to 0.6% Cu.

The pearlite stabilizing agents such as Sn and/or Sb can be added in the form of a powder, a wire, or as a wire comprising a powder of Sn and/or Sb enveloped by means of a metallic or non-metallic casing. The Sn or Sb can be added in combination with an inoculant, e.g., FeSi. Such a combination of the pearlite stabilizing agent and inoculant can be formed as a powder mixture, which is blown into the melt, or as an alloy. The combination can also be formed as a wire comprising the powder mixture enveloped by means of a metallic or non-metallic casing. Also, the inoculant in powder form can be enveloped in a metallic casing on which Sb or Sn is applied on the outside or inside surfaces of the casing. As another variation, a wire comprising the inoculant in the form of a powder enveloped by a casing made from Sn or Sb can be used. As yet another possibility, the addition product of Sn or Sb can be introduced into

the pouring stream in the form of a wire embedded in a powder inoculant which is enveloped by a casing made of a metallic or non-metallic material.

The use of Sb as the pearlite stabilizing agent is especially advantageous since the boiling temperature of Sb is at 1,140°C, i.e., lower than the normal temperature of the molten mass before treatment. Thus, it is relatively easy to convert from the production of pearlitic to ferritic cast irons as Sb residues that may be left behind evaporate during the melting process and do not affect the production of cast iron which is high in ferritic values.

A special advantage of the described process is the possibility of producing ferritic and pearlitic cast iron qualities in one and the same smelting furnace and casting furnace arrangement, without interruption of production in order to completely empty out these units. In this case, the risk that remaining residues of pearlite stabilizing agents may affect the subsequent production of ferritic cast iron is eliminated. The addition of Sn or Sb together with the inoculant in the described wire form into the pouring stream is very advantageous because precise dosing of Sn or Sb is possible.

CLAIMS

1. A process for the manufacture of cast iron high in pearlite content, comprising

producing a molten mass of cast iron in a vessel,

transferring said molten mass to a casting mold, and

introducing a pearlite stabilizing agent into said molten mass while it is being transferred from said vessel to said casting mold.

2. The process of claim 1 wherein said pearlite stabilizing agent is introduced into a pouring stream of said molten mass.

3. The process of claim 1 wherein said pearlite stabilizing agent comprises tin.

4. The process of claim 1 wherein said pearlite stabilizing agent comprises antimony.

5. The process of claim 1 wherein said pearlite stabilizing agent comprises a pearlite stabilizing substance and an inoculant.

6. The process of claim 1 wherein said pearlite stabilizing agent is in the form of a wire.

7. The process of claim 1 wherein said pearlite stabilizing agent is in the form of a powder.

8. The process of claim 1 wherein said pearlite stabilizing agent is in the form of a wire comprising a pearlite stabilizing substance in powder form enveloped by a casing made from a metallic or non-metallic material.

9. The process of claim 1 wherein said pearlite stabilizing agent is in the form of a wire comprising a pearlite stabilizing substance and an inoculant in powder form enveloped by a casing made from a metallic or a non-metallic material.

10. The process of claim 1 wherein said pearlite stabilizing agent comprises an inoculant in powder form enveloped by a casing made from a pearlite stabilizing agent.

11. The process of claim 1 wherein said pearlite stabilizing agent comprises an inoculant in powder form enveloped by a casing and a pearlite stabilizing substance applied as a layer to said casing.

12. The process of claim 1 wherein said pearlite stabilizing agent comprises a pearlite stabilizing substance in the form of a wire embedded in an inoculant in powder form, said powder being enveloped by a casing.

13. The process of claim 1 wherein said cast iron high in pearlite content comprises GG, GGG, or GGV cast iron.

14. A process for the manufacture of cast iron high in pearlite values, comprising

producing a molten mass of cast iron in a vessel,

transferring said molten mass to a casting mold, and

introducing a pearlite stabilizing agent into said molten mass while it is being transferred from said vessel to said casting mold,

wherein said pearlite stabilizing agent is selected from the group consisting of tin and antimony.

15. The process of claim 13 wherein said pearlite stabilizing agent is introduced into a pouring stream of said molten.

16. A pearlite stabilizing agent in wire form comprising a pearlite stabilizing substance in powder form enveloped by a casing, said pearlite stabilizing substance being selected from the group consisting of tin and antimony.

17. The pearlite stabilizing agent of claim 16 further comprising an inoculant in powder form enveloped by said casing.

18. A pearlite stabilizing agent in wire form comprising an inoculant in powder form enveloped by a casing made from a pearlite stabilizing substance selected from the group consisting of tin and antimony.

19. A pearlite stabilizing agent in wire form comprising an inoculant in powder form enveloped by a casing, and a pearlite stabilizing substance applied as a layer to said casing, said pearlite stabilizing substance being selected from the group consisting of tin and antimony.

20. A pearlite stabilizing agent in wire form comprising a pearlite stabilizing substance in the form of wire embedded in a powdered inoculant enveloped by a casing, said pearlite stabilizing substance being selected from the group consisting of tin and antimony.

21. A process according to Claim 1 and substantially as hereinbefore described.

22. A pearlite stabilising agent according to any one of Claims 16 to 20 and substantially as described herein.

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